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Design Employment in UK Regional Economies:

Industrial and Occupational Approaches

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Abstract

This paper uses the dual perspective of industrial and occupational employment to develop a multidimensional overview of the regional geography of design in the UK. Previous literature on the economic geography of design, and the creative economy more generally, is reviewed to demonstrate the value of analyses that combine occupational and industrial measurements of employment. An original classification of design occupations and industries is then developed for use in the study based on a conceptualisation of activities that involve elements of design practice. The results indicate that overall UK employment in design-based occupations is larger than in design-based industries, and while still concentrated in London and the greater south east, is more geographically decentralised. Analysis of design occupation-by-industry patterns shows that the structure of the design workforce can vary considerably between regions, and that areas outside London can support healthy levels of design employment through manufacturing and other activities that represent an alternative to a creative industries cluster model. The conclusion discusses the policy implications of these results.

Keywords: design, industrial employment, occupational employment, creative economy, location quotients.

Introduction

The potential importance of design to local economic development is now well recognised and promoted by policymakers (Bell and Jayne, 2003a; b). On the one hand, design activities form part of the 'creative industries' that have become a key sector of the post-industrial economy of the UK, and certain regions in particular (De Propris *et al.*, 2009). On the other hand, the continuing competitiveness of manufacturing activities in high-wage advanced economies is increasingly reliant on the value created through design as a source of product distinctiveness or improvements in industrial processes (Rusten and Bryson, 2010). More generally, design is starting to be seen, alongside scientific and technological-based research and development, as a possible form of and/or input to innovation (Vinodrai *et al.*, 2007). The key role that design, therefore, has in contemporary economies will only have been reinforced by the recent financial crisis and subsequent imperative for the UK economy to re-balance towards more productive activities (Hutton, 2010).

Accordingly, academic work has also become interested in the economic geography of design. For instance, a recent programme of research on the UK design industry investigated the overwhelming agglomeration of this activity in London, the ways in which this co-location facilitates creativity and collective learning, and the resulting challenges that therefore face design firms in second-tier cities (Reimer *et al.*, 2008; Sunley *et al.*, 2010; 2011). This research concentrated on design agencies that provide consultancy-based services, which is an integral part of the national design economy, and has grown markedly over the past thirty years along the lines of global model developed in the advertising industry, as product and corporate branding in particular have become growing markets for design services (Julier, 2008). However,

this alone does not cover the entirety of design-related activities and impacts hinted at above. Other research has touched on some of the wider forms that design practice assumes in different industries (see next section), but generally through case studies of specific activities instead of attempting to take an overview of the whole UK design economy.

This paper seeks to provide a basis for such an overview by examining the regional geography of design in the UK from the dual, comparative and complementary perspectives of industry and occupational-based employment. It is argued that in general the occupational employment metric, which encompasses designers employed in manufacturing and other service or creative industries as well as the design consultancy sector, provides a more instructive way of viewing the UK design economy. The conceptual basis for this is developed through a classification of the relevant design-based occupations, where design is understood as a set of related practices that include architectural, craft, and engineering-based forms which may not fit easily into existing definitions of creative industry activity. The empirical component of the paper, based on analysis of data from the Labour Force Survey, shows the occupational-based definition leads to a larger estimate of design employment than the corresponding industry-based definition, and that the regional distribution of this employment, whilst still centred on London and the greater south east, is more geographically varied and decentralised. However, the paper also illustrates the need to view occupational and industrial employment as interconnected, and explores how regional concentrations of design occupational employment in the UK are related to agglomerations of design-based and other industries. The conclusion therefore points to alternative forms to the metropolitan

creative industries model that local economies can pursue to develop design-based capabilities.

The paper has five further sections. The literature review outlines the distinction and connection between measures of employment by industry and occupation with particular reference to the creative economy, and then relates these issues to existing work on the economic geography of design. The next section explains the classification of design occupations and industries developed for the study, and estimates the size of the national workforce according to these definitions. A brief methodology outlines the data sources used. The results explore the regional geography of this design workforce through means of descriptive statistics such as location quotients, and further cross-tabulation analysis of how the presence of design occupations in different industries varies between regions. The final section summarises the results and draws policy conclusions.

Creative occupational/industry employment and the geography of design

The basic structure of local or regional economies can be examined through measures of employment by either industry (determined by the types of goods or services supplied by the employing organisation) or by occupation (determined by the different work roles and tasks performed by employees). As Thompson and Thompson (1987; also Feser, 2003) have put it, the industry mix indicates what the region in question *makes*, while the occupational employment profile indicates what the region *does*. In economic development practice the industrial measure of regional employment is most often standard, but a number of (predominately North American) scholars have argued for the complementary utility of an occupational-based

analysis. This is partly because, as Barbour and Markusen (2007) show, the occupational structure of a region cannot simply be 'read-off' from its industrial structure: spatial divisions of labour on a national scale mean that the type and value of functions performed in the same industrial sector can vary substantially between regions. The key methodological point, therefore, is that to fully understand the structure of a regional economy it is necessary to examine the intersection of occupational and industrial employment (Currid and Stolarick, 2010); or in the metaphor employed by Thompson and Thompson (1987), to view the target through two cross-hairs.

One focus of research in this area has been categorising smaller occupational unit classifications together into larger groupings or clusters on the basis of their sharing common features that are deemed characteristic of different types of, for instance, graduate (Elias and Purcell, 2012) or knowledge-based (Feser, 2003; Koo, 2005; Nolan *et al.*, 2011) occupations. Another such possible grouping that has been used in empirical analysis is creative (or cultural) occupations. For instance, Markusen *et al.* (2008) observe that estimates of employment levels in US metropolitan creative economies based on definitions of cultural industries are higher than those based on cultural occupations, because cultural industries include employees from non-artistic support occupations (e.g. managers, administrators, etc.). The other side of this coin is that people in creative/cultural occupations also work in sectors that are not typically defined as being part of the creative/cultural industries. Recent studies in the UK have found that creative occupations are an especially important driver of product innovation in non-creative industries, including in more rural areas as well as

larger cities (Lee and Drever, 2013; Lee and Rodríguez-Pose, 2014). As Cunningham (2011, p.36) argues:

> [a] focus on the creative workforce supports a shift in focus for policy from creative outputs (the creative industries as a specific sector) to creative occupations as inputs into the whole economy, and creative outputs as intermediate inputs into other sectors.

This perspective is especially relevant to an emphasis on design, as designers work across a range of manufacturing, service and (non-design) creative industries as well as in specialised design agencies (Gertler and Vinodrai, 2004; Higgs *et al.*, 2009). Cunningham (2011, p.32) describes design as "the ultimate "ur-discipline" in the creative industries", due to the presence of designers in a wider range of activities than other creative occupations: indeed, he cites his previous research that found more designers actually work in non-creative industries than in creative industries in Australia.

Another very prominent use of occupational data over the past decade has been research exploring Florida's creative class theory (e.g. Florida, 2002; Boschma and Fritsch, 2009; Clifton and Cooke, 2009). The main thesis here, "that regional economic growth is powered by creative people, who prefer places that are diverse, tolerant and open to new ideas" (Florida, 2002, p.249), is based on an analysis of where people in broadly creative occupations (regardless of industry) are concentrated, and the correspondence of this to a number of ostensibly related variables, including levels of innovation and high-tech industry. However, despite the traction that elements of this thesis have gained in the academic literature, Florida's

work has also been subject to substantial critique. This is not least because the definition of the creative class it is founded on is so all-encompassing – including scientific, technological, and professional service occupations more generally – as to be of little specific analytical value (Markusen, 2006; Krätke, 2010). One claim of the creative class thesis is however of interest here: that creative people make location decisions on the basis of lifestyle preferences (typically favouring culturally diverse and vibrant cities) rather than following specific jobs, and the thick labour markets that therefore emerge in these places attract companies to locate there and bring varied employment opportunities (Florida, 2002). As these highly-mobile creative people are defined by membership of certain occupations, an implication that could be drawn from this argument is that the geographical distribution of occupations is not necessarily determined by the regional concentration of certain industries and the spatial division of labour within these sectors (c.f. Barbour and Markusen, 2008), but also by socio-cultural place factors that operate independently of this economic structure. Storper and Scott (2009), however, criticise this tendency in recent work to promote 'urban amenities' as a driver of the location of economic activities. They argue:

> [W]e typically do not observe in empirical reality agglomeration of arbitrarily assorted workers (whether members of the creative class or not), but rather clearly selected types of workers and skills, associated with definite sectors or activities, in particular places. This sorting is primarily an outcome of local productive specialization.
>
> (p.156).

This does not mean an overrepresentation of certain types of skilled workers in the occupational profile of a regional economy is insignificant, as these labour market capabilities are an important part of the formation of 'local productive specializations'. However, again pointing to the need to see occupational and industrial employment as bound-up together, it does suggest that these occupational clusters are closely tied to wider industrial dynamics.

It is interesting to consider previous international research on design in reference to these different positions. Although little of the growing literature on different types of design in economic geography is explicitly framed in terms of industrial and/or occupational employment (although see Vinodrai, 2010), it is clear from most studies that geographical concentrations of designers (and therefore occupational employment) are closely connected to particular industrial specialisations, whether relating to design-based or other industries. Much of this research, like that on creative industries more widely, focuses on the clustering of design activities in large metropolitan areas that offer the opportunity for agglomeration and networking advantages; such as proximity to clients and suppliers, the formation of specialised flexible labour markets, and collective learning or innovation processes based on the exchange of knowledge amongst communities of workers (Scott, 1996; Vinodrai, 2006; Adkins *et al.*, 2007). This and other work (Bell and Jayne, 2003b; Rantisi, 2004; Knox, 2011) has explored the co-constitutive relationship between design practice, the urban environment, and symbolic attributes of particular cities. This also reflects the position of these design centres as the location for creative functions within global production networks, particularly for instance in the fashion industry (Jansson and Power, 2010). However, despite this tendency to situate design creativity within urban milieus, this literature generally stops short of supporting the

creative class argument that large numbers of people in design occupations in these cities is a product of urban amenities, instead of the creative industry agglomeration and related labour market factors mentioned above (although see Leslie and Brail, 2011). Indeed, the study of UK design agencies mentioned in the introduction, while noting the presence of 'creative buzz' in places such as London, finds this to be of secondary importance to "economic factors that embed the leading agencies in the capital, namely and most importantly, access to clients and a ready [labour market] supply of talented individuals" (Reimer *et al.* 2008, p.167).

Moving outside of a creative industries/cities framework, in a study of industrial design service firms in the USA, MacPherson and Vanchan (2010, p.84-85) find:

> a regional pattern of design specialization that closely matches the nature of local industrial activity. While there is no doubt that industrial designers are a subset of Florida's (2002) creative class, their spatial distribution does not correlate strongly with any kind of 'coolness index'. As a result, design-related activity tends to mirror the geography of production.

For instance, their research indicates that 'rust belt' metropolitan areas such as Detroit and Buffalo have "an above average share of design companies that serve clients in the automotive and machinery sectors" (p.85). This indicates the continuing existence of regions where design and production functions are co-located, despite the increasingly geographically distributed nature of supply-chains in the modern economy (Clark, 2013). Similarly, Bertacchini and Borrione (2013) show that industrial design activities in Italy are located in traditional industrial districts specialising in craft-based and low-technology production, as well as in larger

metropolitan areas that have developed content and service-oriented creative industries. These studies are still focused on design industries, but taking more of an occupational perspective, the close relationships to local productive specialisations found would presumably only be reinforced if in-house design teams within manufacturing firms were also counted. The role of designers as a source of innovation and value creation in other industries, while not necessarily quantified, has been reflected in various other studies. For example, only taking work with a UK-based empirical focus, this has involved research on industries both traditional and new; from lock manufacture (Bryson *et al.*, 2008) and ceramics (Tomlinson and Branston, 2014), to racing car production (Henry and Pinch, 2000) and videogame development (Vallance, 2014). Taken together, these studies are interesting for highlighting the role of design in activities that exhibit a different spatial logic to clustering in culturally vibrant metropolitan areas[i]. So not only are design occupations linked to the wider industrial structure of a region, but different forms of design will have different locational patterns.

Defining the UK design workforce

A crucial part of this study therefore is the definition of both design occupations and industries to be used in the analysis. This does not follow any extant classificatory schemes of creative industries (such as those developed by the UK Department of Culture, Media and Sport) or creative occupations (such as Florida's creative class) but instead seeks an understanding of design as a more specific set of (still inherently creative) activities or practices. Therefore, while including the sub-component of the creative industries/occupations that refers to product, fashion and graphic design, this also seeks to encompass forms of architectural, engineering-

based, interactive media, and craft-based design that may reach into sectors not covered by these established creative economy definitions. This also means that the selection of design industries/occupations is done at the detailed sub-class/unit level.

Following the axiom that occupational employment refers to the type of work performed rather than product created (Feser, 2003), the occupational classification used here is based on an interpretation of jobs that contain an element of some form of design practice. The approach taken is influenced by a previous definition of design occupations (within the Standard Occupational Classification (SOC) 2000) in a report produced by the UK Intellectual Property Office. Based on estimates of varying proportions of working-time spent doing design, this identified four 'core' design occupations – design and development engineers, architects, graphic designers, and product, clothing and related designers - and a broader range of 'related' design occupations split into the three groups of engineers, technicians, and trades and crafts (Thompson *et al.*, 2012). The classification for this study adopts the same distinction between core and related (or associated) design occupations, but develops a different classification of these groupings and the occupations within them using the updated SOC2010 (table 1). These were selected through searching of the accompanying documentation for the SOC2010; in particular the detailed descriptions of occupational unit groups (4 digits) in Volume 1 (ONS, 2010a) and the coding index in Volume 2 that allocates more specific job titles (including many different possible forms of design) to the appropriate occupational unit (ONS, 2010b).

The core design occupations included in the classification are the same as identified by Thompson *et al.* (2012) with the exception of web design and development

professionals, a new unit for SOC2010, being added. This gives a group of five occupations that cover major areas of design: engineering, web/new media, architectural, graphic, and product or fashion. These occupations are interpreted as those in which design practice is likely to be the primary focus of the work. The associated or related design occupations included are, by contrast, those which may involve some design functions, but alongside other non-design based tasks, so that the definition is less clear-cut. It is possible that some members of these occupations may spend much of their time performing design-based work, while (unlike the core design occupations) there will be many within the same unit of classification who work predominately on non-design related functions. These have been divided into five sub-groups. First, the associated designers group contains two occupations that provide architectural design services (2435 and 3121), and draughtspersons who now use computer-aided design to produce technical drawings for engineering, manufacturing and architectural design processes. Second, the design-related engineers group contains the remaining engineering professionals occupations in the SOC2010 as they are all described as involving research and design amongst their defining tasks (ONS, 2010a)[ii]. Third, design-related IT professionals includes two large occupations (2135 and 2136) that are engaged in the design and development of IT systems and software, alongside other related tasks such as testing, maintenance, and consultancy that are distinct from but may blur the line with design. Fourth, design-related artists represent the connection between design and contemporary artistic and visual media practice. Fifth, the design-related crafts group are for skilled trades in which design, instead of being separated from production by a division of labour, is often embedded in the actual making, assembly and/or decoration of a particular object[iii].

The identification of design industries, using the Standard Industrial Classification (SIC2007), is more straightforward (**table 2**). There is a single class for specialised design activities, which covers design agencies in the areas of fashion, industrial, graphic, and interior design. From the group 'architectural and engineering activities and related technical consultancy' (71.1), the sub-classes of architectural activities and engineering design activities for industrial process and production have been included as substantially consisting of design activities from their description (ONS, 2009). This has not included two other industrial subclasses in this group that may involve some design activities and, analogous to the occupational classification above, could be interpreted as 'related' design industries – urban planning and landscape architectural activities (71.11/2) and other engineering activities (71.12/9). People in design occupations will, of course, be employed across these and other service or manufacturing industries as discussed above. However, these other industries are not determined in advance here, but identified as part of the subsequent analysis (see appendix).

Table 3 gives estimates of 2013 UK employment (main job only) for these core design occupations, associated/related design occupational groups, and design industries[iv]. It is notable here that the total for core design occupations (324,100) exceeds the total for the design industries (257,200). This could be seen in-part as an artefact of how the standard industrial and occupational classifications are structured. For instance, where 'web design and development professionals' are included as a separate occupational unit in SOC2010 (and therefore here as a core design occupation), website design activity is classified as part of the much larger computer programming activities in SIC2007 and therefore not represented here amongst the dedicated design industries. Nevertheless, the comparison is interesting

when considered against the finding of Markusen *et al.* (2008) cited earlier, that estimates of employment in the US creative economy are larger when measured by cultural industries than by cultural occupations. This contrast would seem to support the claim of Cunningham (2011) that designers are a special case in relation to creative occupations as a whole, due to their wider 'embeddedness' in non-creative industries.

Figure 1, adapting the 'Creative Trident' model (Higgs *et al.*, 2008; Cunningham, 2011), shows how the core, associated/related, and other (non-design) occupations in the 2013 employment estimates are distributed between the design and other industries. This demonstrates that, in accordance with the finding of Cunningham (2011) for Australia's creative economy, employment in core design occupations is much higher (219,300) outside dedicated design industries than inside them (104,800) (although again this differential will be magnified by most web designers being employed in activities not classified here in the design industries). Aggregating across the five boxes gives an estimate of 1,482,100 for overall design-related employment (around 5% of total UK employment), although a majority (1,005,600) of this is accounted for by associated/related designers working outside design industries.

The case for favouring an interpretation of the design workforce primarily as a set of occupations rather than industries can therefore be made not just on the basis of the occupational measure ('what people do') arguably being a more accurate and meaningful indicator of the presence of design practice, but also by this being likely to generate a more inclusive estimate of the size of this workforce that reflects the range of inputs it will make to the UK economy. Whether this occupational approach

leads to a different picture of the geography of design in the UK economy than focusing on design industries alone will now be explored.

Data Sources

The main empirical part of this paper uses data from the Quarterly Labour Force Survey (QLFS). This includes information on the industry and occupation of employment of survey respondents at the high level of specificity needed to match the classifications outlined in the previous section. As the analysis involves examining the data through detailed cross-tabulations of employment by industry, occupation, and region, the single QLFSs were not judged to have a large enough sample size to generate a robust number of expected observations for many instances. Data from four editions of the QLFS, beginning with the first in which SOC2010 was used for the coding of occupational data, were therefore merged into a single dataset on which the analysis was undertaken. The QLFS is composed of five waves (i.e. the same participants are interviewed for five successive quarters before dropping out), so the four editions used – Q1 2011, Q2 2012, Q3 2013, Q4 2014 - were selected to ensure there was no overlap (and therefore potentially double counting) of respondents. Inclusion of all data from these editions (as opposed to, for instance, just selecting respondents from the first wave of consecutive quarters) means that the weighting variable supplied (to ensure that even with variations in response rates the totals will gross to 2014 regional population estimates) could be used to reach more accurate estimations of the relative employment levels for designers in different regions on which the analysis is based. Respondents to the QLFS who were not in employment, and also those whose region of work was outside the UK, would not be included in the subsequent

analysis and so were also excluded from the dataset at this stage. To simplify the results, the analysis only refers to the main job of respondents and not the QLFS data on second jobs. This gave a dataset with a total of 185,249 cases, and within this, 1,859 observations of employment in the core design occupations, 6,377 in the associated and related design occupations, and 1,544 in the design industries. This approach means that the results cannot be said to refer to a specific point in time, but assuming that the regional distribution of employment in design industries and occupations has remained fairly stable over the recent four year period from which data has been taken, they can be taken as a good indicator of the current geographical patterns with which the research is concerned.

The QLFS variable used for region of work includes categories for the six metropolitan counties in England, central, inner and outer London, and Strathclyde, as well as NUTS-level-1 regions. However, to ensure the number of observations for each geographical unit was as high as possible, the data for the metropolitan sub-regions have been aggregated and analysis carried out only for the twelve regions. The preliminary analysis indicated that results for metropolitan counties (e.g. Greater Manchester, Merseyside) were not consistently higher than for non-metropolitan regions (e.g. Rest of North West), suggesting that these city-region units were not at a sufficiently focused scale for any possible effect of concentrations of design employment in urban centres (e.g. Manchester, Liverpool) to be clearly visible. Therefore, the paper is concerned with the regional rather than metropolitan geography of design; although the London region, that figures prominently in the discussion throughout, falls into both categories.

Regional geography of design in the UK

Industrial and occupational location patterns

This sub-section examines the spatial distribution of design industries and occupations in the UK. Three descriptive statistical techniques have been used to analyse the data outlined above. First, regional location quotients (LQs) for the various design industries and occupations. Second, the corresponding coefficient of localization for each industry and occupation (CL). This is a measure (between 0 and 1) of the relative concentration of employment in that activity across different regions, where a value closer to 0 indicates a more even distribution, and higher values a greater level of concentration in certain regions (Burt *et al.* 2006, p.126). Third, the correlation of regional LQs between the different industries/occupations has been tested using the Pearson Correlation Coefficient. This indicates where there is a relationship between design industries or occupations being located together in the same regions. The positive relationships cited below are significant at the $p<0.01$ level unless otherwise stated.

Table 4 shows the LQs for the design industries (with the regions ranked by the combined industrial LQ). Unsurprisingly London is the top region overall due to very high (>2) LQs for both specialised design and architectural activities. The LQs for these two industries are significantly correlated (r value=0.862), although London is the only region with a LQ above 1 in both industries. Engineering Design for Industry by comparison has a much lower LQ in London (0.47) and is most concentrated in the West Midlands (LQ=1.83), East of England (1.55), and South East (1.38). This countervailing trend - of engineering-based design exhibiting a different spatial

pattern to other types of design as regards not being centred in London - is mirrored in the results for design occupations below and explored in the subsequent discussion. This does not, however, mean that the engineering design industry is markedly less concentrated as a whole: the CL value of 0.184 is almost as high as for architectural (0.214) and specialised design (0.192) activities. The other side of these patterns is that half of the twelve regions – the South West, Yorkshire and Humber, North West, North East, Wales, and Northern Ireland – have LQs below 1 for all three of the design industries, and a seventh (Scotland) only has a LQ just above 1 for Engineering Design Activities.

London again has the highest regional LQ value for all of the five core design occupations (table 5) apart from design and development engineers, who are highly concentrated in the East Midlands (LQ=1.92), South West (1.72), and East of England (1.36). The four core occupations that are most concentrated in London also have LQs of 1.10 or above in either the East or South East of England (and both in the case of graphic designers). This suggests the presence of larger occupational clusters of designers centred in London, but extending outwards to include at least one of these coterminous regions that can be said to make up the greater south east. There are also, however, unrelated LQs above 1 for these occupations in other regions; including the North West, North East and Wales (web), Scotland and Northern Ireland (architects), Yorkshire and Humber (graphic), and East Midlands (product, clothing and related). Notably, this means that in contrast to the design industries, all twelve regions have a LQ above 1 for at least one core design occupation (see discussion below). This variability helps explain why amongst the core design occupations the only positive correlation of regional LQs significant at

the P<0.01 level is between graphic designers and product, clothing and related designers (r=0.781). Weaker positive relationships, significant at the p<0.05 level, do exist for graphic and product/clothing designers with both web designers and architects. Extending this analysis to include the associated and related designers, the design-related IT professionals and design-related artists fit the pattern of being centred primarily in London (LQs>1.5), but also in the surrounding east and south east of England (LQs>1). The regional LQs for these related design occupations are also significantly correlated with both the core occupations of graphic and product/clothing designers.

Comparing between the results for design industries and occupations, CL values for the core design occupations, with the exception of architects, are lower than for the design industries (indicating more even distribution). The CL values for the associated and related design occupations, apart from design-related IT professionals (0.151) and design-related artists (0.164), are lower still – associated designers (0.073), design-related engineers (0.069), and design (0.070). This pattern is reinforced by the observation that eight of the twelve regions have higher LQs for the five core design occupations combined than for the three design industries combined. The only regions with clearly higher LQs for the design industries combined are London (1.74 compared to 1.53) and, due to the very high result for the engineering design industry, the West Midlands (0.94 compared to 0.70). Amongst the regions exhibiting the reverse pattern, the South West and East Midlands are notable for the difference (0.83 to 1.04 and 0.88 to 1.02) meaning that the LQs for the core designers rise above 1.

This signals two things. First, while the geography of design occupations in the UK is still centred on London and the greater south east, this is to a lesser extent than the geography of design industries. Second, this higher level of decentralisation suggests that the distribution of design occupations, while in general related closely to the location of design industries, is not fully aligned. This, therefore, means it will also be interconnected with the location of other industries.

Regional occupation design employment by industry

To explore these more complex geographical patterns it is necessary, as Thompson and Thompson (1987) amongst others argue, to examine the intersection of occupational and industrial employment; and specifically in this case, how levels of design occupational employment in different industries vary across regions. This will allow investigation of whether concentrations of occupational employment are attributable to the presence of certain design-intensive industries in these regions alone, or whether variation in the proportion of designers within the workforces of these industries in different regions (reflecting the spatial divisions of labour discussed by Barbour and Markusen, 2007) is also a factor. For this analysis, the range of different industries in which designers work have been classified into three groups: design-based industries, design-intensive services, and design-intensive manufacturing. Explanation of this classification and the list of constituent industries for these groups are covered in the appendix. The individual design occupations are employed unevenly across the industrial groupings[v], but to ensure that the numbers of observations in the further cross-tabulations by region are sufficient, the data is

analysed here at the aggregated levels of the five core design occupations, and the core plus associated and related (CAR) design occupations.

The regional LQs for core and CAR designers in each of the three industrial groups are given in bold in **table 6** (where the regions are ranked by their LQ for all core designers). These regional occupation-by-industry LQs can be disaggregated into two component parts that are also given in this table. First, the relative size of employment in the industrial grouping as a whole in the region, which here is measured by the LQ. Second, the percentage of the total workforce in the group that are employed in core/CAR design occupations, which here is taken to indicate the design intensity of the industrial activity in that region. The percentage of all employees that are core/CAR designers has been expressed as an index with the level for the UK overall (shown at the bottom of the table) given the base value of 1. This is therefore in the same indexed form as the industrial grouping LQ, so that multiplying these two values together gives the LQ for core/CAR designers in the industrial groupings (in bold). For instance, the LQ for core designers in the design-based industries of 2.00 in London is the regional LQ for design-based industries as a whole (1.43) multiplied by the index value for the percentage of core designers (1.40). In this case, because the two multiplier values are roughly the same, the very high concentration of core designers in design-based industries in London can be understood as a product of both the concentration of design-based industries in the capital and the higher than UK proportion of the workforce in these industries who are employed in core design occupations, with the two components having a similar weighting. However, in other cases the two values will be different. For instance, the very high design-intensive services group LQ for London (1.90) ensures that, even

with index values for the percentage of core/CAR designers in these workforces being below 1 (0.93/0.81), the corresponding occupation-by-industry LQs are still high (1.77/1.54). In this instance it would therefore appear that this industry-specific occupational concentration of core and CAR designers is related to the presence of the overall London agglomeration of these types of advanced services, rather than any intra-industry divisions of labour that mean these activities are necessarily more design-intensive in this region than others. Similar patterns, albeit less clear-cut, are observable for the design-based industries and design-intensive services in the South East of England.

In other cases, however, regions without strong industrial agglomerations may still have occupation-by-industry concentrations if the percentage of core/CAR designers in that activity is sufficiently above that of the UK overall. For instance, both the East of England and South West have industry group LQs below 1 for the design-intensive services (0.98 and 0.91), but occupation-by-industry LQs above 1 (1.31/1.30 and 1.10/1.06) due to high index values for percentage of core and CAR designers in these industries (1.34/1.33 and 1.20/1.16). The three northern English regions and Wales also have high index values for the percentage of core designers in the design-intensive services, but the lower LQs for this industrial group overall means that in these cases it does not translate into an occupation-by-industry LQ above 1. These results could reflect pockets of web designers (that are heavily represented amongst core designers in the design-intensive services) serving local markets in these regions (see Pratt *et al.*, 2007). However, the level of core/CAR designers in an industrial group will be affected by a complex mix of potential factors in each region - including differences in the mix of the industrial divisions (that themselves will have

varying levels of design-intensity) within these groups, and possibly even the average size of firms (and therefore the degree of occupational specialisation in intra-organisational divisions of labour) - which would require further analysis beyond the scope of this paper to untangle.

Nevertheless, the potential importance of this core/CAR percentage index variable can be seen by looking at the results for design-intensive manufacturing. In contrast to the other two industrial groupings, nine of the twelve regions have group LQs for design-intensive manufacturing above 1 (counterbalanced by the very low value of 0.33 for London). This reflects the diverse geography of manufacturing employment across different sub-sectors in the present-day UK economy (see Bryson *et al*. 2013). There is, however, a clear north-south divide in the results for the core/CAR percentage index, with those regions in southern England (here including the East and East Midlands) having values above 1, and all other regions values below 1. This means that for three of the southern regions – East of England, South West, and East Midlands – the combination of concentration of design-intensive manufacturing industries and the higher than average design-intensity of these activities translates into notable occupation-by-industry concentrations (1.40/1.26, 1.63/1.39, and 2.00/1.66 respectively). An interesting contrast is with the West Midlands, the region with the highest group LQ (1.61), but where the low index value for percentage of core designers (0.65) means that the occupation-by-industry LQ is only just over 1 (although the corresponding CAR result is higher). The high core/CAR % index values for the southern regions may be related to local clusters of certain particularly design-intensive divisions within the manufacturing group – for instance, manufacture of other transport (which includes the aerospace industry) in the South West and

East Midlands. However, examining the data at this division level (where low numbers of observations makes a fuller analysis unfeasible), the results for different regions do not seem to be explainable by this kind of agglomeration of specific manufacturing industries alone.

It is possible to overstate the magnitude of the intra-group division of labour observed here: the low UK values (2.81% and 13.76%) used as a base mean that even in the South West, for example, core designers still only account for just over 4% of total employment in design-intensive manufacturing, and CAR designers (including all engineering occupations) less than 17%. Nonetheless, the industry group-specific occupational concentrations they help produce can have a marked effect on the size of a regional design workforce as a whole. In the East of England the occupation-by-industry LQs for design-intensive manufacturing are matched by similarly high values for the design-based industries and design-intensive services, indicating a diverse and strong design workforce. In the South West and East Midlands, however, the occupation-by-industry LQs for design-intensive manufacturing are much higher than for design-intensive industries. This helps explain the pattern noted in the previous section that for these regions the LQs for design occupations (especially design and development engineers) are generally higher than the LQs for the design industries. The East Midlands is especially interesting because the occupation-by-industry LQs for the design-intensive services are also very low (0.52/0.70). This is reflected in the structure of different regional design workforces in terms of the distribution of design employment across different industries. The percentage of all core designers in the East Midlands who are employed in design-intensive manufacturing (30.0%) is nearly double that for the UK as a whole (15.2%), and almost as high as the

percentage employed in the design-based industries in the region (32.1%). The percentage employed in the design-intensive services (11.2%), on the other hand, is close to half that for the UK as a whole (22.0%). This contrasts starkly with London where 48.6% of core designers are employed in the design-based industries (versus 37.1% for the UK), 25.5% in design-intensive services, and only 5.4% in design-intensive manufacturing. The corresponding profile of the South West is closer to that of the UK as a whole than the East Midlands for the design-based industries and design-intensive services, but it still has a higher percentage of core designers employed in design-intensive manufacturing (23.8%). These very different profiles demonstrate that regions can have relatively strong design economies that do not necessarily follow the creative agglomeration model exemplified by London.

Conclusion

The dual-analysis of industrial and occupational design in this paper has yielded a number of findings that taken together point to a more complex understanding of the geography of the UK design economy. First, based on estimate of size of employment alone, the different core design occupations combined are larger than the corresponding design industries, even before the range of associated or related occupations that are likely to involve an element of design practice have been counted. In line with international research, there are more core designers working outside than inside dedicated design industries in the UK. Second, designers are concentrated in southern England, with occupational clusters of graphic, product/clothing, web, architectural, and related IT professionals and artists, centred on London. The design and development engineers were an exception to this

amongst core designers in not being concentrated in London, but the East Midlands, South West, and East of England. Third, despite these patterns, design occupational employment was overall more evenly distributed than design industrial employment, which is highly concentrated in London for architectural and specialised design activities, and the West Midlands, East and South East of England for engineering design activity. This reflects that, while much design employment in the UK is tied to agglomerations of these and other advanced services in the greater south east, the presence of designers in other industries means that there are further salient geographical patterns of design occupational employment (albeit not on the same scale). Fourth, regional occupational pockets of designers exist in design-intensive service and manufacturing (as well as design-based) industries, through different combinations of overall concentration of employment (agglomeration) and design-specialisation in divisions of labour within these groups. In the South West and East Midlands particularly the high occupation-by-industry concentrations in design-intensive manufacturing is key to the overall above UK level of core designers employed in their economies. This indicates that localities outside London (and other metropolitan centres) can build-up resources of design expertise with a different character to that of a creative industries cluster. Follow-up research is however needed on this point, which goes beyond the provisional focus of this study on just employment levels, and examines the structure of design-intensive industries in these regions in terms of, for instance, supply chain relationships between firms (e.g. Leslie and Reimer, 2006).

The basic policy lesson from this paper, therefore, is that local practitioners should recognise and seek to engender the economic development potential of design in the

expanded way opened-up by an occupational definition. As Cunningham (2011) argued in reference to the creative economy more generally, this wider view of the relevant workforce leads to a view of design as an input and source of value-added to production and innovation processes in the economy as a whole rather than certain specialist industries. An objective of policy therefore could be promoting the employment of skilled designers by companies across different sectors of the local economy, as well as encouraging the development of dedicated design enterprises. This would entail what Markusen (2004) calls 'occupational targeting' within the local economic development strategy, and the introduction of measures that could encourage more designers to live and work in the area. While this may cover a range of design-related initiatives, including those related to the cultural environment of the place (Bell and Jayne, 2003a), the argument of this paper that the location of professional occupational employment is (in contrast to the creative class thesis) closely interlinked with particular productive activities, means that measures targeting skilled design practitioners would have to be joined-up with appropriate evidence-based industrial development policies to help ensure the existence of suitable job roles for them in the local economy. Public support agencies could play a part here in providing services or programmes to help increase this labour demand through expanding the design capabilities of indigenous firms (particularly SMEs). The approach to analysis of occupation-by-industry LQs developed in this paper could also help guide whether a particular region would have more to gain from focusing on increasing their overall concentration of certain design-intensive (service or manufacturing) industries, or from trying to increase the proportion of designers within the local workforce of these industries. As most people employed in design occupations are university educated[vi], and graduates in creative disciplines from HE institutions throughout the UK have a strong tendency to locate in London (see

Comunian *et al.*, 2014), initiative to increase retention rates from local universities in design-related subjects (including engineering and architecture as well as art-based courses) could be a specific focus for effective interventions by policymakers in other regions.

Appendix

The selection of industrial groups began with cross-tabulation of design occupations by industry division (2 digit). This showed that some of the industrial divisions with the most core designers overall relate to larger sectors of the economy (e.g. retail, education, public administration and defence, construction), so that the proportion of designers in their overall workforce is actually low. The presence of designers in these sectors is not uninteresting, but to ensure the subsequent comparative analysis would not be obscured by the size of these industries, all divisions in which the core designers accounted for less than 1% of estimated employment, or had fewer than 10 observations in the combined dataset, have been excluded from the analysis. The remaining industries have then been allocated into the three groups defined in **table 7**. For the design-intensive services and design-intensive manufacturing this has been done at the division level. However, for the design-based industries this has been done at the class/sub-class level to again give a precise focus on the relevant design-intensive activities. This includes the three classes/sub-classes identified as the main design industries, but also the related industries of urban planning and landscape architectural activities and other engineering activities mentioned earlier. Other activities from these two divisions (71 and 74), in which the cross-tabulation revealed very few core designers work, have not been included – for instance, engineering related scientific and technical

consulting (71.12/2) and photographic activities (74.20). Under the thresholds applied, twelve divisions have qualified as part of the design-intensive manufacturing group (against nine for the design-intensive services), but this has still meant that large manufacturing sectors such as chemicals, pharmaceuticals and food production have been excluded for not being sufficiently design intensive.

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[i] In this way they provide case study illustration of Lee and Rodríguez-Pose's (2014) finding that creative occupations in non-creative industries (amongst which designers will be prominent) are sources of innovation in the UK outside as well as inside London and other major cities.

[ii] Some areas of industrial design are also allocated to these occupations in the coding index, rather than to the core product designers (3422) or design and development engineers (2126) occupations: for instance, aircraft and naval design to mechanical engineers (ONS, 2010b).

[iii] Where design in areas such as clothing, glassware, furniture, and jewellery is a specialist role, it should according to the coding index be allocated to the product, clothing and related designer occupation (ONS, 2010b). However, the description of the skilled trades included in this group indicate that in many situations, particularly where production is still carried out in small enterprises, the work will involve a creative element that can be interpreted as closely related to design (ONS, 2010a). This group also includes occupations that are allocated to other areas of design in the coding index, such as typographical design (5421) and floral design (5443) (ONS, 2010b).

[iv] The results in this section (table 3 and figure 1) are from Quarterly Labour Force Survey (QLFS) 2013 individual data (weighted to 2014 population figures). The totals given are the individual weights grossed to a population estimate and then averaged across the four quarters.

[v] For instance, in the design-intensive services 51.4% of all core designers are web designers and another 29.4% graphic designers. In design-intensive manufacturing 60.6% of all the core designers are design and development engineers, 22.1% product, clothing and related designers, and 13.4% graphic designers. In the design-based industries, by contrast, the group is more mixed with 34.1% architects, 28.4% graphic designers, 21.5% product, clothing and related designers, and 14.8% design and development engineers (but only 1.3% web designers).

[vi] From the QLFS data combined for this study, an estimated 63.2% of the core designers have a highest qualification level of a degree or equivalent, and for another 14.4% it is another form of higher education qualification (e.g. a diploma).

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Tables and Figures

Table 1. Design Occupations.

Group	Occupation Unit Group (SOC2010)	Code
Core Designers	Design and development engineers	2126
	Web design and development professionals	2137
	Architects	2431
	Graphic designers	3421
	Product, clothing and related designers	3422
Associated Designers	Chartered architectural technologists	2435
	Architectural and town planning technicians	3121
	Draughtspersons	3122
Design-Related Engineers	Civil engineers	2121
	Mechanical engineers	2122
	Electrical engineers	2123
	Electronics engineers	2124
	Production and process engineers	2127
	Engineering professionals not elsewhere classified	2129
Design-Related IT Professionals	IT business analysts, architects, and systems designers	2135
	Programmers and software development professionals	2136
Design-Related Artists	Artists	3411
	Photographers, audio-visual and broadcasting equipment operators	3417
Design-Related Craft	Tool makers, tool fitters, and markers-out	5222
	Precision instrument makers and repairers	5224
	Tailors and dressmakers	5414
	Textiles, garments, and related trades not elsewhere classified	5419
	Pre-press technicians	5421
	Glass and ceramics makers, decorators and finishers	5441
	Furniture makers and other craft woodworkers	5442
	Florists	5443
	Other skilled trades not elsewhere classified	5449

Source: Author's own elaboration based on SOC2010.

Table 2. Design Industries.

Industry Class/Sub-Class (SIC2007)	Code
Architectural activities	71.11/1
Engineering design activities for industrial process and production	71.12/1
Specialised design activities	74.10

Source: Author's own elaboration based on SIC2007.

Table 3. Estimated size of design occupation and industry employment 2013

Design Industry		Core Design Occupation		Associated/Related Design Occupation	
Architectural activities	64,300	Architects	54,700	Associated designers	60,800
Engineering design activities	73,900	Design engineers	62,200	Design-related engineers	357,400
Specialised design activities	119,000	Product, clothing, related designers	61,800	Design-related IT professionals	349,000
		Web designers	62,900	Design-related artists	123,700
		Graphic designers	82,600	Design-related craft	156,300
Total	**257,200**	**Total**	**324,100**	**Total**	**1,047,200**

Source: Calculated from QLFS 2013.

Figure 1. Estimated occupational employment 2013 for design and non-design industries

A1 - Employed in Core Design Occupation in Design Industries **104,800**	B1 - Employed in Core Design Occupation in Non-Design Industries **219,300**
A2 - Employed in Associated or Related Design Occupation in Design Industries **41,600**	B2 - Employed in Associated or Related Design Occupation in Non-Design Industries **1,005,600**
A3 - Employed in Non-Design Occupation in Design Industries **110,800**	Design-related Workforce Total = **1,482,100** Total Economy Employment = **29,673,000** Design-related % of Total Employment = **4.99%**

Source: Calculated from QLFS 2013.

Table 4. Regional LQs for design industries.

Region	Architectural Activities	Engineering Design	Specialised Design Activities	**All Design Industry**
London	2.33	0.47	2.13	**1.74**
South East	0.94	1.38	1.10	**1.14**
East of England	1.25	1.55	0.68	**1.07**
West Midlands	0.44	1.83	0.70	**0.94**
East Midlands	0.59	1.28	0.82	**0.88**
South West	0.88	0.79	0.82	**0.83**
Yorkshire and Humber	0.63	0.87	0.80	**0.77**
Scotland	0.87	1.02	0.57	**0.77**
North West	0.60	0.89	0.78	**0.76**
North East	0.70	0.70	0.63	**0.67**
Wales	0.64	0.36	0.53	**0.51**
Northern Ireland	0.73	0.22	0.49	**0.48**
CL	*0.214*	*0.184*	*0.192*	*0.140*
UK	**1**	**1**	**1**	**1**

Source: Calculated from QLFS 2011-2014.

Table 5. Regional LQs for core design occupations.

Region	Design Engineers	Web Designers	Architects	Graphic Designers	Product, clothing, related designers	**All core designers**
London	0.37	1.63	2.38	1.70	1.82	**1.53**
East of England	1.36	0.91	1.45	1.25	0.68	**1.13**
South East	1.05	1.10	0.89	1.22	1.18	**1.10**
South West	1.72	0.90	0.78	0.75	0.95	**1.04**
East Midlands	1.92	0.67	0.58	0.71	1.05	**1.02**
North West	1.07	1.11	0.58	1.00	0.77	**0.92**
Yorkshire and Humber	0.71	0.77	0.37	1.07	0.86	**0.78**
North East	1.03	1.13	0.47	0.48	0.64	**0.75**
Scotland	0.86	0.68	1.08	0.57	0.61	**0.74**
West Midlands	1.07	0.57	0.56	0.61	0.61	**0.70**
Northern Ireland	0.53	0.33	1.35	0.69	0.59	**0.68**
Wales	0.55	1.07	0.53	0.56	0.62	**0.66**
CL	*0.164*	*0.134*	*0.244*	*0.163*	*0.162*	***0.108***
UK	1	1	1	1	1	**1**

*Source***:** Calculated from QLFS 2011-2014.

Table 7. SIC2007 Industry Classes/Divisions allocated to design related industrial groups.

Design industries (Class/Sub-class)	**71.11/1** (Architectural activities); **71.11/2** (Urban planning and landscape architectural activities); **71.12/1** (Engineering design activities for industrial process and production); **71.12/9** (Other engineering activities); **74.10** (Specialised design activities).
Design-intensive services (Division)	**58** (Publishing activities); **59** (Motion picture, video and television programme production, sound recording and music publishing activities); **61** (Telecommunications); **62** (Computer programming, consultancy and related activities); **70** (Activities of head offices; management consultancy activities); **72** (Scientific research and development); **73** (Advertising and market research); **90** (Creative, arts, and entertainment activities); **94** (Activities of membership organisations).
Design-intensive manufacturing (Division)	**13** (Manufacture of textiles); **14** (Manufacture of wearing apparel); **18** (Printing and reproduction of recorded media); **22** (Manufacture of rubber and plastic products); **25** (Manufacture of fabricated metal products, except machinery and equipment); **26** (Manufacture of computer, electronic and optical products); **27** (Manufacture of electrical equipment); **28** (Manufacture of machinery and equipment n.e.c.); **29** (Manufacture of motor vehicles, trailers and semi-trailers); **30** (Manufacture of other transport equipment); **31** (Manufacture of furniture); **32** (Other manufacturing).

Source: Author's Elaboration based on data from QLFS 2011-2014.

Table 6: Regional design occupation-by-industry LQs, industrial group LQs, and design occupations % of industry workforce index

Region	Overall	Design-based Industries			Design-intensive Services			Design-intensive manufacturing		
	Core/CAR LQ	**Core/CAR LQ**	Group LQ	Core/CAR % index	**Core/CAR LQ**	Group LQ	Core/CAR % index	**Core/CAR LQ**	Group LQ	Core/CAR % index
London	1.53 / 1.22	**2.00 / 1.60**	1.43	1.40 / 1.12	**1.77 / 1.54**	1.90	0.93 / 0.81	**0.54 / 0.41**	0.33	1.66 / 1.26
East of England	1.13 / 1.14	**1.20 / 1.20**	1.14	1.05 / 1.05	**1.31 / 1.30**	0.98	1.34 / 1.33	**1.40 / 1.26**	1.10	1.28 / 1.15
South East	1.10 / 1.14	**1.00 / 1.09**	1.12	0.89 / 0.98	**1.22 / 1.33**	1.20	1.02 / 1.11	**1.01 / 1.08**	0.98	1.03 / 1.11
South West	1.04 / 1.03	**0.96 / 1.02**	0.89	1.08 / 1.14	**1.10 / 1.06**	0.91	1.20 / 1.16	**1.63 / 1.39**	1.13	1.44 / 1.23
East Midlands	1.02 / 0.97	**0.88 / 0.82**	0.86	1.02 / 0.95	**0.52 / 0.70**	0.68	0.76 / 1.03	**2.00 / 1.66**	1.50	1.34 / 1.11
North West	0.92 / 0.89	**0.75 / 0.84**	0.85	0.88 / 0.99	**0.99 / 0.77**	0.77	1.28 / 1.01	**0.92 / 1.03**	1.05	0.87 / 0.98
Yorkshire and Humber	0.78 / 0.86	**0.73 / 0.82**	0.81	0.89 / 1.00	**0.74 / 0.71**	0.65	1.14 / 1.09	**1.00 / 1.01**	1.16	0.86 / 0.87
North East	0.75 / 0.80	**0.59 / 0.62**	0.86	0.68 / 0.71	**0.84 / 0.67**	0.63	1.33 / 1.06	**0.51 / 0.79**	1.12	0.45 / 0.71
Scotland	0.74 / 0.92	**0.75 / 0.95**	0.95	0.79 / 1.00	**0.54 / 0.66**	0.70	0.78 / 0.94	**0.60 / 0.64**	0.76	0.79 / 0.84
West Midlands	0.70 / 0.92	**0.57 / 0.74**	0.96	0.59 / 0.77	**0.39 / 0.73**	0.78	0.50 / 0.94	**1.05 / 1.40**	1.61	0.65 / 0.87
Northern Ireland	0.68 / 0.76	**0.82 / 0.61**	0.44	1.85 / 1.36	**0.47 / 0.67**	0.52	0.90 / 1.28	**0.67 / 0.92**	1.02	0.66 / 0.91
Wales	0.66 / 0.69	**0.51 / 0.52**	0.62	0.82 / 0.84	**0.69 / 0.56**	0.58	1.20 / 0.97	**0.94 / 0.78**	1.05	0.90 / 0.74
UK overall percentage (= base value 1)	1.06%/ 4.62%	**0.39%/ 0.70%**	1.50%	26.24%/ 46.38%	**0.23%/ 1.17%**	7.25%	3.22%/ 16.19%	**0.16%/ 0.79%**	5.75%	2.81%/ 13.76%

Source: Calculated from QLFS 2011-2014.